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**HUMAN RESOURCES**

**FLIGHT SCREENING PROGRAM EFFECTS ON  
ATTRITION IN UNDERGRADUATE PILOT TRAINING**

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<p>The effectiveness of the USAF Flight Screening Program (FSP) for pilot candidates was evaluated by comparing the Undergraduate Pilot Training (UPT) performance and attrition rates of groups of candidates given variations of the normal FSP. The data indicated that FSP was successful at reducing UPT attrition. Candidates who received no FSP had higher attrition than a control group who received the normal screening, whereas candidates who received 6 additional flying hours had lower attrition. However, there was no difference in attrition rates between a control group and an experimental group who was allowed to enter UPT regardless of FSP performance, suggesting that the benefits of FSP are due to an experience and training effect. Additionally, those candidates in the unscreened group rated as failures by the FSP Instructor Pilots (IPs) also had higher than normal attrition. Regression analyses indicated that FSP grades could be used to predict UPT performance. A combination of scores from an experimental psychomotor test combined with FSP grades from lesson 8 proved to be as predictive of UPT performance as the final five lesson grades (8-12), suggesting that a UPT screening decision could be made at an earlier stage of FSP than is the current practice.</p>					
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**This publication is primarily a working paper. It is published solely to document work performed.**

## SUMMARY

The results of a research and development (R&D) effort to assess the value of the USAF Flight Screening Program (FSP) for reducing Undergraduate Pilot Training (UPT) attrition are reported. The analyses indicated that Instructor Pilots (IPs) in the program can identify UPT training risks with reasonable accuracy and that lesson grades received by students in the FSP are reliably related to UPT pass/fail outcome. The effectiveness of the screening, however, is naturally related to the rejection ratio at the end of the FSP.

The benefit of the training and experience provided by the FSP is strongly reflected in UPT outcomes: Students who entered UPT without previous FSP experience incurred UPT attrition rates significantly higher than those who had completed the FSP but had not been screened. This benefit was enhanced by 6 hours of extra flying time in the FSP.

When information provided by experimental psychomotor test scores was combined with FSP lesson grades, it was found that the FSP flying time could be reduced by 6 hours without deterioration in screening efficiency.

The results of the present effort suggest that pre-selection by psychomotor tests and screening after 8 hours of FSP flying would achieve reduced UPT attrition. Also, additional training in FSP would transfer to UPT and would result in further reduction of attrition losses. Further R&D is suggested to support future policy decisions on whether the FSP should be primarily a screening program or a lead-in training phase for UPT.

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## PREFACE

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## TABLE OF CONTENTS

	Page
I. INTRODUCTION . . . . .	1
II. APPROACH . . . . .	1
Subjects . . . . .	1
Performance Criteria . . . . .	2
III. RESULTS . . . . .	2
Overall Effects of FSP: Does FSP Achieve Anything? . . . . .	4
Screening Effects of FSP: Does FSP Screen Effectively for UPT? . . . . .	5
Identification of Potential UPT Failures During FSP . . . . .	5
The Effects of FSP Screening on UPT Attrition: Comparison of Screened and Unscreened FSP Groups . . . . .	5
FSP Screening: Does FSP Provide An Opportunity For SIE? . . . . .	6
Training/Experience Effects of FSP: Does the FSP Give a Training/ Experience Benefit in UPT? . . . . .	7
Training/Experience Effects of FSP: Would a Longer FSP Give Greater Benefit in UPT? . . . . .	7
The Relationships Between FSP Lesson Grades and UPT Results: Could A Shorter FSP Provide Adequate Prediction? . . . . .	8
Prediction of UPT Results From FSP Lesson Grades 8 - 12 . . . . .	9
The Influence of Psychomotor Test Scores . . . . .	9
Summary of Results . . . . .	10
IV. DISCUSSION . . . . .	11
REFERENCE . . . . .	11
APPENDIX A: TABLES . . . . .	13

## LIST OF FIGURES

Figure	Page
1 T-37 Phase Outcomes of Experimental FSP Groups . . . . .	3
2 UPT Final Outcomes of Experimental FSP Groups . . . . .	4

# LIST OF TABLES

Table	Page
1 UPT Outcome Data for FSP Groups . . . . .	3
A-1 Overall (Screening and Training) Effect (Groups I & III), T-37 Phase, Overall Attrition . . . . .	14
A-2 Overall (Screening and Training) Effect (Groups I & III), T-37 Phase, FTD Attrition . . . . .	14
A-3 Overall (Screening and Training) Effect (Groups I & III), UPT Final Outcome Overall Attrition . . . . .	14
A-4 Overall (Screening and Training) Effect (Groups I & III) UPT Final Outcome FTD Attrition . . . . .	15
A-5 Screening Effect (Group III versus FSP Passes in Group IV), T-37 Phase, Overall Attrition . . . . .	15
A-6 Screening Effect (Group III versus FSP Passes in Group IV), T-37 Phase, FTD Attrition . . . . .	15
A-7 Screening Effect (Group III versus FSP Passes in Group IV), UPT Final Outcome, Overall Attrition . . . . .	16
A-8 Screening Effect (Group III versus FSP Passes in Group IV), UPT Final Outcome, FTD Attrition . . . . .	16
A-9 Screening Effect (Group IV FSP Passes versus Fails), T-37 Phase, Overall Attrition . . . . .	16
A-10 Screening Effect (Group IV FSP Passes versus Fails), T-37 Phase, FTD Attrition . . . . .	17
A-11 Screening Effect (Group IV FSP Passes versus Fails), UPT Final Outcome, Overall Attrition . . . . .	17
A-12 Screening Effect (Group IV FSP Passes versus Fails), UPT Final Outcome, FTD Attrition . . . . .	17
A-13 Screening Effect (Group III versus IV), T-37 Phase, Overall Attrition . . . . .	18
A-14 Screening Effect (Groups III versus IV), T-37 Phase, FTD Attrition . . . . .	18
A-15 Screening Effect (Groups III versus IV), UPT Final Outcome, Overall Attrition . .	18
A-16 Screening Effect (Groups III versus IV), UPT Final Outcome, FTD Attrition . . . .	19
A-17 Screening Effect, SIE at UPT, T-37 Phase . . . . .	19
A-18 Screening Effect, SIE at UPT, UPT Final Outcome . . . . .	19



# List of Tables (Continued)

Table	Page
A-19 Training/Experience Effect (Groups I versus IV), T-37 Phase, Overall Attrition . . . . .	20
A-20 Training/Experience Effect (Groups I versus IV), T-37 Phase, FTD Attrition . . . . .	20
A-21 Training/Experience Effect (Groups I versus IV), UPT Final Outcome, Overall Attrition . . . . .	20
A-22 Training/Experience Effect (Groups I versus IV), UPT Final Outcome, FTD Attrition . . . . .	21
A-23 Effect of 6 Hours Extra FSP Training (Groups II versus III), T-37 Phase, Overall Attrition . . . . .	21
A-24 Effect of 6 Hours Extra FSP Training (Groups II versus III), T-37 Phase, FTD Attrition . . . . .	21
A-25 Effect of 6 Hours Extra FSP Training (Groups II versus III), UPT Final Outcome, Overall Attrition . . . . .	22
A-26 Effect of 6 Hours Extra FSP Training (Groups II versus III), UPT Final Outcome, FTD Attrition . . . . .	22
A-27 Zero-Order Correlations Between Variables, T-37 Phase, Pass/Overall Attrition (All Cases) . . . . .	22
A-28 Zero-Order Correlations Between Variables, T-37 Phase, Pass/FTD Attrition (All Cases) . . . . .	23
A-29 Prediction of T-37 Phase Pass/Overall Attrition, Result by FSP Grades for Lessons 8 - 12 (FSP Group III, N = 514) . . . . .	23
A-30 Prediction of T-37 Phase Pass/FTD Attrition, Result by FSP Grades for Lessons 8 - 12, (FSP Group III, N = 465) . . . . .	24
A-31 Zero-Order Correlations Between Variables, UPT Pass/Overall Attrition (All Cases) . . . . .	25
A-32 Zero-Order Correlations Between Variables, UPT Pass/FTD Attrition (All Cases) . . . . .	25
A-33 Prediction of UPT Pass/Overall Attrition Results by FSP Grades for Lessons 8 - 12 (FSP Group III, N = 514) . . . . .	26
A-34 Prediction of UPT Pass/FTD Attrition Results by FSP Grades for Lessons 8 - 12 (FSP Group III, N = 458) . . . . .	27

# List of Tables (Concluded)

Table		Page
A-35	Zero-Order Correlation Between Variables T-37 Pass/Overall Attrition (Cases with Psychomotor Test Scores, N = 122) . . . . .	28
A-36	Prediction of T-37 Phase Pass Overall Attrition Results by FSP Grades for Lessons 8 - 12 (Cases with Psychomotor Test Scores, N = 122) . . . . .	29
A-37	Zero-Order Correlations Between Variables, T-37 Pass/FTD Attrition (Cases with Psychomotor Test Scores, N = 109) . . . . .	30
A-38	Prediction of T-37 Phase Pass/FTD Attrition Results by FSP Grades for Lessons 8 - 12 (Cases with Psychomotor Test Scores, N = 109) . . . . .	31
A-39	Zero-Order Correlations Between Variables, UPT Pass/Overall Attrition (Cases with Psychomotor Test Scores, N = 122) . . . . .	32
A-40	Prediction of UPT Pass/Overall Attrition, Results by FSP Grades for Lessons 8 - 12 (Cases with Psychomotor Test Scores, N = 122) . . . . .	33
A-41	Zero-Order Correlations Between Variables, UPT Pass/FTD Attrition (Cases with Psychomotor Test Scores, N = 108) . . . . .	34
A-42	Prediction of UPT Pass/FTD Attrition Results by FSP Grades for Lessons 8 - 12 (Cases with Psychomotor Test Scores, N = 108) . . . . .	35

# FLIGHT SCREENING PROGRAM EFFECTS ON ATTRITION IN UNDERGRADUATE PILOT TRAINING

## I. INTRODUCTION

Candidates for training as pilots in the Air Force who do not have a Private Pilot's License and who either will be commissioned through the Officer Training School (OTS) or are already commissioned are required to go through the Flight Screening Program (FSP). The FSP is a 14-hour program of flying in the T-41 (Cessna 172), a light piston-engined aircraft. Each sortie flown by a student is graded by the instructor pilot (IP) who flies with him/her. Satisfactory grades must be maintained for continuation in the program. When 12 flying hours have been completed, a Final Evaluation Flight is administered in which the student is tested on the basic flying skills taught in the program. If a satisfactory grade is obtained on the Final Evaluation Flight, the student proceeds to Undergraduate Pilot Training (UPT). If the grade obtained is unsatisfactory, the student is allowed to retake the evaluation and, if still unsatisfactory, is then classified as having failed the program for reasons of flying training deficiency (FTD) and is not allowed to proceed to UPT. Students with particularly poor performance may be eliminated before reaching the Final Evaluation Flight. The program thus acts as a screening stage for entry to UPT.

Students may also be eliminated from the program for reasons other than FTD; chiefly, for medical reasons or by self-initiated elimination (SIE). This latter form of elimination may be regarded, to some extent, as a process of self-screening, in that students who find that they do not like flying, or that flying does not agree with them, are able to withdraw from flying training before they reach UPT.

In 1980, an experimental evaluation of the FSP was begun, with the aim of determining the effects of the program on UPT, particularly its effectiveness in reducing attrition in UPT below the level that would be expected without FSP. The research plan used may be regarded as essentially addressing six questions:

1. Does the FSP have any effect on UPT attrition rates?
2. If the FSP does affect attrition rates, is the effect from screening, training, or both?
3. If the effect is from screening, does it screen by elimination for FTD, or by SIE, or both?
4. Does the FSP confer a flight training and/or experience benefit?
5. If there is a training/experience effect, would a longer program of FSP flying significantly increase the training/experience benefit?
6. How are lesson grades received in the FSP related to success or failure in UPT? Would a shorter FSP provide adequate prediction of UPT results?

## II. APPROACH

### Subjects

Different FSP treatments were used for different groups of pilot candidates, who were then followed through UPT. Five groups were defined as follows:

- Group I (No FSP.) Consisted of 123 entrants who would normally have been required to complete the FSP but were allowed to enter UPT directly. These cases, therefore, were unscreened and untrained.
- Group II (Extended FSP.) Consisted of 57 entrants who were given an extended FSP of 20 hours instead of the normal 14 hours, although screening was still applied at the 14-hour point. These cases, therefore, had 6 extra hours of FSP training and experience.
- Group III (Normal FSP.) Consisted of 514 students who passed through the normal 14-hour FSP and were screened at the 14-hour point. These cases, therefore, had normal FSP and were screened. This group may be regarded as a control group.
- Group IV (Unscreened.) Consisted of 266 students who were given the normal 14-hour FSP but, regardless of performance, were sent on to UPT. In effect, these subjects were trained but not screened.
- Group V (FSP Failures.) Defined as a subgroup of Group IV and consisted of 34 of the 266 (13%) who were judged by the FSP IPs to be FSP failures for FTD reasons. However for this research, they were allowed to proceed to UPT. The members of this group, therefore, had received 14 hours of flying experience but were considered to be unsuitable for UPT.

#### Performance Criteria

The FSP treatment effects were evaluated for impact on the following criteria:

1. Pass/fail for FTD reasons at the end of the T-37 (Primary Flight) phase of UPT.
2. Pass/fail for all reasons at the end of the T-37 phase of UPT.
3. Pass/fail for FTD reasons at the end of UPT.
4. Pass/fail for all reasons at the end of UPT.

Failure for academic reasons was not included in the criteria. In the total sample used in this effort, there were only nine such cases, and these were dropped from the analyses. More refined criteria than the dichotomous ones listed above were not available.

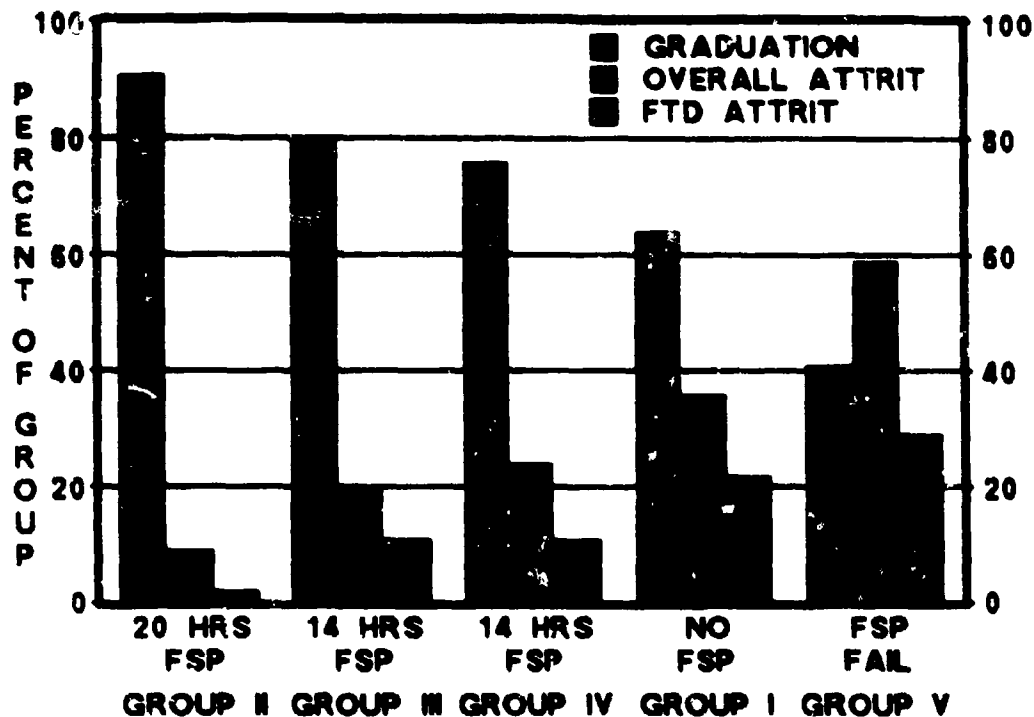
### III. RESULTS

Comparisons were made between different groups to provide the answers to the six primary questions posed in the research plan. Results were based primarily on chi-square analyses. Regression analyses were also used to identify the relative contributions of different aspects of FSP on UPT attrition.

The T-37 and final UPT training outcomes for each of the five groups are given in Table 1. The graduation, FTD, and overall attrition rates for the T-37 phase, and final UPT results, are also shown graphically in Figures 1 and 2. A complete listing of all contrast statistics is provided in the Appendix.

**Table 1. UPT Outcome Data for FSP Groups**

	FSP experimental groups									
	I		II		III		IV		V	
	N	%	N	%	N	%	N	%	N	%
<b>T-37 Phase</b>										
FTD	27	25	1	2	56	11	30	11	10	29
Non-FTD	17	14	4	7	49	10	34	13	10	29
All Eliminees	44	36	5	9	105	20	64	24	20	59
Graduates	79	75	52	91	409	80	202	76	14	41
<b>Final UPT Outcome</b>										
FTD	34	28	2	4	78	15	42	16	13	38
Non-FTD	20	16	5	18	56	11	39	15	11	32
All Eliminees	54	44	7	12	134	26	81	30	24	71
Graduates	69	56	50	88	380	74	185	70	10	29
Total N	123		57		514		266		34	



**Figure 1. T-37 Phase Outcomes of Experimental FSP Groups.**

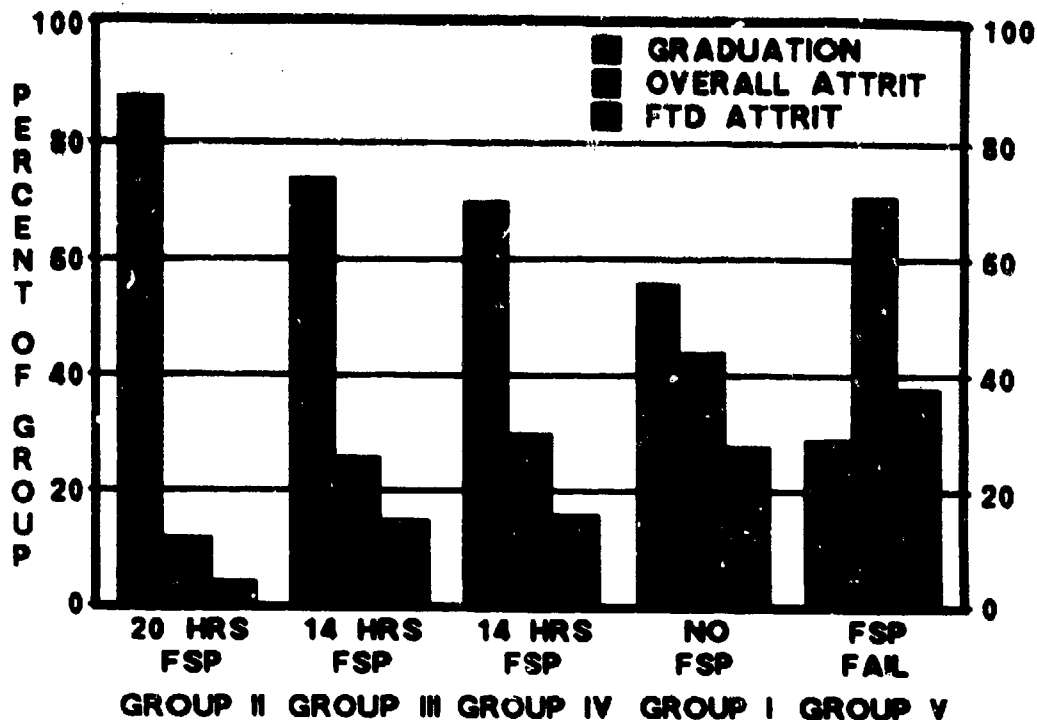


Figure 2. UPT Final Outcomes of Experimental FSP Groups.

#### Overall Effects of FSP: Does FSP Achieve Anything?

If the FSP achieves nothing in terms of reduced UPT attrition, it is not acting as a screening device and is conferring no training/experience benefit. To determine whether FSP has any effect on UPT attrition, the UPT outcomes of trainees who had entered UPT without previous FSP experience or screening (Group I) were contrasted with those of trainees who had taken the normal 14-hour FSP (Group III). The results of these comparisons are given by phase of training.

T-37 Phase of UPT. Table 1 and Figure 1 show overall attrition in the T-37 phase. This was found to be significantly lower ( $p < .001$ ) in the group that had been through FSP, compared with the group that had not. In Group III (normal FSP), overall attrition was 20%; and in Group I (no FSP), 36% (Table A-1). Students who had been through FSP also had a significantly lower T-37 FTD attrition rate (12%) than did those who had entered UPT directly (25%;  $p < .001$ ; Table A-2).

UPT Final Outcome. Table 1 and Figure 2 show final UPT attrition for all reasons. This was also significantly lower in the group that had been through FSP (26%) than in the group that had not (44%) ( $p < .001$ ; Table A-3). Attrition for FTD reasons was also significantly lower (17% versus 33%; Table A-4;  $p < .001$ ).

Conclusions. FSP has a significant effect on UPT attrition rates. Students who had been through FSP had lower attrition rates in the T-37 phase and overall UPT for both FTD and all other reasons.

### Screening Effect of FSP: Does FSP Screen Effectively for UPT?

If the FSP screens out probable UPT FTD eliminatees by eliminating them for FTD in FSP, it is fulfilling its primary purpose. If it screens out SIEs, this may be a valuable method of identifying poor motivation or adaptation. If neither of these screening mechanisms is operating, then the FSP effect on UPT attrition is probably through flying training/experience.

Whether the FSP screens effectively for UPT may be approached in two different ways. The first question that may be asked is: "Can individuals who are likely to fail in UPT be identified at FSP?" The second question is: "Does the screening which takes place at FSP significantly reduce attrition rates in UPT?" The first question is concerned primarily with the validity of the FSP as a method of identifying potential UPT failures. The second question is more complex, in that the answer depends on organizational factors such as the cut-off standards applied in FSP and the consequent rejection ratios.

### Identification of Potential UPT Failures During FSP

To determine whether potential UPT failures could be identified after 12 hours of flying during FSP, it was necessary to compare attrition rates in UPT between the 34 FSP "failures" admitted to training (Group V) and the FSP graduate element of the complete unscreened group (Group IV)<sup>1</sup>. First, it was necessary to show that this graduate element did not differ significantly from a normal screened group. The UPT outcomes of the Group IV graduates were, therefore, first compared with those of the control group (Group III). These analyses indicated that there were no significant differences in overall or FTD attrition, either at the T-37 phase or final UPT outcome, between the FSP graduates in Group IV and the control group, Group III (see Tables A-5 to A-8). Following these comparisons, the FSP failures were compared to their FSP graduate contemporaries.

T-37 Phase of UPT. The 34 FSP failures showed significantly ( $p < .001$ ) higher overall (59%) and FTD (42%) attrition rates at the end of the T-37 phase than did their contemporaries in Group IV (19% and 10%, respectively; Tables A-9 and A-10).

UPT Final Outcome. Similar results were obtained for the UPT final outcome criteria. The 34-member FSP-failure group (Group V) had significantly ( $p < .001$ ) higher overall (71% versus 25%) and FTD (57% versus 14%) attrition rates than did their FSP-graduate contemporaries in Group IV (Tables A-11 and A-12).

Conclusions. These results indicate that some high UPT failure risks can be identified at FSP with a good degree of accuracy (only 29% of those identified as FSP failures graduated from UPT).

### The Effects of FSP Screening on UPT Attrition: Comparison of Screened and Unscreened FSP Groups

To determine whether FSP screening had a significant effect on UPT attrition, the UPT outcomes of cases in Group III, who had been through the normal 14-hour FSP and had been screened, were compared with the UPT results of Group IV, who had been through FSP but had not been screened. The latter group contained the 34 FSP failures identified as Group V.

<sup>1</sup>Contemporaries of Group V were examined to minimize the effects of any changes in FSP and UPT over time.

T-37 Phase of UPT. The chi-square analyses revealed no significant differences in overall or FTD attrition rates between Group III and Group IV (Tables A-13 and A-14).

UPT Final Outcome. The analyses revealed no significant differences in UPT results between the screened and unscreened groups. For overall attrition, the rates were 26% for the screened group and 30% for the unscreened group (Table A-15). For the FTD attrition criterion, the rates were 17% for the screened group and 19% for the unscreened group (Table A-16).

Conclusions. The implication of these findings is that the 14-hour FSP, with screening at the twelfth lesson, did not achieve effective screening for entry to UPT. However, before finalizing such a conclusion, two aspects of the research should be noted.

1. The significant difference in UPT attrition between individuals identified in FSP as high UPT risks (FSP failures) and those judged to be better risks (FSP graduates) has shown that the FSP examiners could discriminate with a reasonable degree of accuracy.

2. Evidence from analyses (described later) of the relationships between FSP lesson grades and UPT outcomes also indicated that the lesson grades significantly predicted the UPT outcome criteria.

Therefore, although these analyses were unable to show that FSP had a significant screening effect on UPT attrition, there are strong indications that performance in FSP is related to performance in UPT. Methods will be suggested later in this paper regarding how that relationship can be capitalized upon to produce a significant screening effect.

#### FSP Screening: Does FSP Provide an Opportunity for SIE?

Some individuals who have had no previous flying experience (other than as passengers) may find, after a certain amount of flying training, that they do not wish to continue. This decision is likely to be made early in flying training, and would therefore be expected to occur at FSP. However, if such individuals entered UPT directly, without the FSP, the first opportunity for SIE would be at UPT. The SIE rate at UPT, therefore, would be expected to be higher in a group that had not undergone the FSP. Furthermore, most of this SIE should occur in the early stages of UPT.

An indication of whether the FSP provided a useful self-screening opportunity before entry to UPT was obtained by comparing SIE attrition rates in UPT in the unscreened group that was given FSP (Group IV) and the group that was allowed to enter UPT without being required to go through the FSP (Group I). If the FSP provides an opportunity for individuals who wish to withdraw voluntarily from flying to do so at that stage, it could be hypothesized that the number taking this action at UPT would be proportionately lower in the group that had been through FSP than in the group that had not and thus had had no opportunity to self-eliminate before UPT.

This kind of analysis is always subject to the limitation that the labels applied may sometimes not reflect the true reason for elimination. Self-initiated elimination is sometimes the result of a realization by the individual (with perhaps a hint from external sources) that elimination for FTD in the near future is probable. Conversely, elimination for FTD may sometimes just preempt SIE or, rather than self-eliminating, the student may deliberately perform at a standard that will ensure elimination for FTD. The extent to which these things happen is unknown. On the assumption that it is not great, the labels were taken at face value.

T-37 Phase of UPT. This phase would be expected to bear most of the SIE in the group that had no FSP experience. In the group that had been through FSP, the SIE rate at UPT was 6%.



whereas in the group that had not been through FSP, the rate was 9%. This difference was not statistically significant (Table A-17).

UPT Final Outcome. In the group that had been through FSP, the UPT SIE rate was 7%, whereas in the group that had not been through FSP, the rate was 10%. Again, this difference was not significant (Table A-18).

Conclusions. Most of the SIE that occurred in UPT was, in both groups, concentrated in the T-37 phase. The analysis did not support the suggestion that FSP provides a useful opportunity for early SIE. Self-initiated elimination at UPT was not significantly higher in the group that had not been through FSP than in the group that had.

#### Training/Experience Effects of FSP: Does the FSP Give a Training/Experience Benefit in UPT?

Although the analyses conducted to identify a screening effect from FSP were not conclusive, the next step was to examine whether FSP provides training/experience which lowers UPT attrition. Possible training and/or experience benefits of the normal 14-hour FSP were examined through comparisons between the UPT results of the group that was not required to attend FSP (Group I) and those of the group that went through the FSP but was not screened (Group IV). Higher UPT success rates for Group IV would be attributable to the training and experience received by this group in the FSP. The most sensitive criterion in these analyses would be expected to be the pass/fail ratio for the FTD criterion.

T-37 Phase of UPT. This analysis revealed that the group with no FSP experience had a significantly ( $p < .05$ ) higher overall attrition rate at the end of the T-37 phase than the unscreened FSP group (Table A-19). FTD attrition differed in the same direction even more significantly ( $p < .01$ ) between the two groups (25% in the no-FSP group and 13% in the FSP-experienced group; Table A-20).

UPT Final Outcome. Overall attrition was significantly ( $p < .05$ ) higher in the no-FSP group than in the FSP-experienced group (44% versus 30%; Table A-21). Again, attrition for FTD reasons was also significantly ( $p < .01$ ) higher in the no-FSP group (33% versus 19%; Table A-22).

Conclusions. The FSP confers a significant training/experience benefit as reflected in the UPT attrition rates, and particularly in the FTD rates. Attrition rates were lower among students who had passed through FSP (even though no screening was applied) than among those who had not been to FSP.

#### Training/Experience Effects of FSP: Would a Longer FSP Give Greater Benefit in UPT?

If the effect of FSP on UPT attrition is due to training/experience, would a longer FSP course provide greater benefit? This possibility was evaluated next. One group of students (Group II) was given 6 hours of extra flying experience at the FSP. Those who had not reached a satisfactory standard by the Final Evaluation Flight were screened out at that point, but the remainder entered UPT with a total of 20 hours of FSP flying experience instead of the normal 14 hours. Differences in UPT attrition rates favorable to this group in comparison with those for the group that had received the normal 14-hour FSP with screening at the 12-hour point would be attributable to the extra 6 hours of flying experience in the FSP. Again, FTD was expected to be the most sensitive criterion for these analyses.

T-37 Phase of UPT. With regard to overall attrition at this stage, statistically there was no difference between the 20-hour FSP group (9%) and the 14-hour FSP group (20%; Table A-23), but the 11% difference was close to statistical significance. FTD attrition, however, was significantly lower ( $p < .05$ ) in the 20-hour FSP group (2%) than in the normal-FSP group (12%; Table A-24).

UPT Final Outcome. At the end of UPT, overall attrition was significantly lower in the 20-hour FSP group (12%) than in the normal-FSP group (26%;  $p < .05$ ; Table A-25). The difference in FTD attrition was also significant ( $p < .05$ ; 4% and 17%, respectively; Table A-26).

#### The Relationships Between FSP Lesson Grades and UPT Results: Could a Shorter FSP Provide Adequate Prediction?

The analyses described earlier showed that the FSP functions, to some extent, as a lead-in training program for UPT. Moreover, although the screening effect was not strong enough to be reflected in significantly reduced UPT attrition rates, there was some evidence that UPT training risks could be identified in the FSP. It would be expected that training progress and overall suitability for UPT entry would be expressed in the FSP sortie grades received by students.

The length of the current FSP was based primarily on subjective assessment of previous experience of screening programs in various Air Forces, and it would be useful to determine whether it might be possible to predict UPT results equally well at an earlier stage than the present Final Evaluation Flight at Lesson 12. Information on this question could be obtained from analysis of the relationships between FSP lesson grades and UPT results. It was considered unlikely that FSP performance before Lesson 8 would provide reliable prediction; therefore, the analysis examined the five grades for Lessons 8 through 12 only. Possible grades were: 1 = unsatisfactory, 2 = fair, 3 = good, and 4 = excellent. These grades were assigned by the Instructor Pilots as a normal procedure in FSP.

The sample used in these analyses was the FSP experimental group, Group III (N = 514), which contained only those cases which had received the normal FSP and been screened. The data were analyzed using multiple regression techniques. Initially, only the FSP lesson grades were included in the prediction equation. Then, the effect of including other information from an experimental psychomotor test was examined. Psychomotor test scores were not on record for all cases in the sample, and Ns were thus reduced as indicated in the descriptions of the individual results.

The psychomotor test scores represented performance on two tests: (a) Two-Hand Coordination, and (b) Complex Coordination. Two-Hand Coordination is a continuous pursuit tracking task in which the subject is required to track, with a + -shaped cursor, a target moving about in a circle. The movement of the cursor is controlled by two joysticks. One joystick controls the right-left ( $X_1$ -axis) movement of the cursor, while the other joystick controls the up-down ( $Y_1$ -axis) movement. Complex Coordination is a compensatory tracking test in which the subject is required to keep a cursor as close as possible to the intersection of a vertical row and a horizontal row of dots while at the same time keeping a short bar of light as close as possible to the vertical row of dots. The movement of the cursor in the right-left ( $X_2$ -axis) and up-down ( $Y_2$ -axis) is controlled by a large floor-mounted joystick, while the movement of the short bar of light in the right-left ( $Z_2$ -axis) is controlled by a rudder bar. Both tests were administered on a single testing station developed as part of an R&D project evaluating the usefulness of apparatus/computer testing for UPT selection (Bordelon & Kantor, 1986).

For both tests, scores were obtained by summing the absolute displacements from the cursor to the target point and, for the Complex Coordination test, from the bar of light to the vertical

row of dots. For each 1-minute period, five scores were produced. Each score represents one of the control axes. Because the scores reflect tracking error, lower test scores indicate better performance.

#### Prediction of UPT Results From FSP Lesson Grades 8 - 12

T-37 Phase of UPT. The correlation matrices for the T-37 phase criteria are at Tables A-27 and A-28. For prediction of T-37 overall attrition ( $N = 514$ ), the best prediction equation contained all five lesson grades ( $R^2 = .119$ ). Any other equation with fewer grades gave significantly poorer prediction (Table A-29). For prediction of T-37 FTD attrition ( $N = 465$ ), use of all five grades gave  $R^2 = .092$ , but the sum of the five grades ( $R^2 = .077$ ) was statistically as good as this or any other combination (Table A-30).

UPT Final Outcome. The correlation matrices for the UPT final outcome criteria are at Tables A-31 and A-32. For the UPT final overall attrition criterion ( $N = 514$ ), the best prediction equation again contained all five lesson grades ( $R^2 = .115$ ). Any other equation gave significantly poorer prediction (Table A-33). For the UPT final FTD attrition criteria ( $N = 458$ ), a model containing the grades for Lessons 11 and 12 provided roughly the same level of predictive accuracy ( $R^2 = .075$ ) as the model containing all five grades ( $R^2 = .089$ ). This model also appeared to be slightly better than the linear sum of the five lesson grades ( $R^2 = .067$ ; Table A-34).

Conclusions. These results show that for optimum prediction of overall attrition in both the T-37 phase and UPT overall, the five grades for FSP Lessons 8 through 12 are needed. Therefore, any attempt to predict UPT outcome at an earlier stage in FSP would result in significant loss of UPT predictive information.

#### The Influence of Psychomotor Test Scores

T-37 Phase of UPT. The correlation matrix for the T-37 phase overall attrition criterion is at Table A-35. For the T-37 phase overall attrition criterion ( $N = 122$ ), with the five FSP lesson grades and the five psychomotor scores as predictors, an  $R^2 = .177$  was obtained. However, a prediction equation containing the psychomotor scores and only the grade received for FSP Lesson 8 was found to be statistically equivalent ( $R^2 = .170$ ; Table A-36) to the equation containing all the lesson grades.

The correlation matrix for the T-37 phase FTD criterion is at Table A-37. For the T-37-phase FTD criterion ( $N = 109$ ), with all FSP lesson grades and psychomotor test scores in the equation,  $R^2 = .216$ . The most parsimonious prediction equation which accounted for not significantly less information than the full 10-predictor model again contained the psychomotor scores and the grade received for FSP Lesson 8 ( $R^2 = .208$ ; Table A-38).

UPT Final Outcome. The correlation matrix for the UPT final outcome overall attrition criterion is at Table A-39. For this criterion ( $N = 122$ ), use of all 10 predictors gave  $R^2 = .153$ . However another equation not differing significantly from the full 10-predictor model consisted of the five psychomotor test scores and the grade for FSP Lesson 8 ( $R^2 = .134$ ; Table A-40).

The correlation matrix for the UPT final outcome FTD attrition criterion is at Table A-41. For this criterion ( $N = 108$ ), with all predictors in the equation,  $R^2 = .183$ . Again, a prediction equation statistically equivalent to the full 10-predictor model contained the five

psychomotor scores and the grade for FSP Lesson 12 ( $R^2 = .178$ ). However, the predictor set containing the psychomotor test scores and the grade for Lesson 8 gave only slightly less prediction ( $R^2 = .167$ , a loss of 1%) and also did not differ statistically from the full model (Table A-42).

**Conclusions.** The most parsimonious equation for predicting the UPT criteria contained the psychomotor test scores and the grade received for FSP Lesson 8. Thus, with psychomotor testing, it would seem that the FSP could be reduced from 12 to 8 lessons without deterioration in prediction of UPT attrition.

### Summary of Results

1. The analyses showed that the current 14-hour FSP had significant positive effects on attrition in UPT. Attrition rates were lower in the group that had undergone the FSP (Group III) than in the group that had not (Group I).

2. High UPT attrition risks could be identified in FSP. However with the data available for analysis, no difference in attrition rates in UPT was apparent between the group that had been screened in the FSP (Group III) and the group that had not (Group IV).

3. There was no statistical support for a self-screening function of the FSP; self-initiated elimination in UPT was no higher in the group that had not been to FSP (Group I) than in the group that had (Group IV).

4. There was clear evidence that the FSP conferred a significant flight training and experience benefit. Attrition rates in UPT were lower among pilots who had taken the 14-hour program without being screened (Group IV) than among students who had been allowed to enter UPT directly (Group I). As would be expected, this effect was related more strongly to the FTD attrition criterion.

5. Extension of the FSP to 20 hours of flying gave an additional training benefit. Attrition rates in UPT were significantly lower in a group that had received the extended FSP (Group II) than in the group which had undergone the 14-hour FSP (Group III).

6. When FSP lesson grades were used as the sole predictors of UPT outcomes, inclusion of the final five lesson grades in the equation was necessary to obtain maximum prediction.

7. When psychomotor test scores were included in the equations, these gave better prediction of the UPT criteria than did the FSP lesson grades alone. With the test scores in the prediction equation, the grade for Lesson 8 could be used to predict the criteria without significant loss of information relative to the use of FSP grades for Lessons 9 through 12. This result suggests that, with psychomotor tests, screening after 8 hours of FSP would be adequate for the prediction of UPT performance.

8. Caution is necessary with regard to the relative weights of psychomotor scores and FSP lesson grades. The sample analyzed had been selected into UPT on the basis of FSP results, and therefore this variable was restricted in range; this was not so with respect to the psychomotor test scores. This may have given the psychomotor test scores undue weight in the regression equations.

#### IV. DISCUSSION

The main issue addressed in this effort was the effectiveness of the FSP. The data reported here indicate that the FSP was effective in reducing UPT attrition rates. The failure to detect differences in either FTD or SIE attrition between screened and unscreened pilot candidates suggests that FSP confers an experience/training effect, a conclusion supported by the finding that candidates who received an extra 6 hours of training manifested a lower attrition rate. However, the findings that individuals who were potential high risks for UPT training could be identified in FSP, and that grades awarded for FSP lessons significantly predicted UPT outcomes, are strong indications that some useful screening may or could take place in the FSP. Furthermore, regression analyses showed that if psychomotor test scores are available, a UPT screening decision could be made after FSP Lesson 8.

Consideration about the "trade-offs" of these findings needs to be made. With pre-selection using psychomotor tests, or by use of an index based on psychomotor test scores and the grade for Lesson 8, the FSP could be shortened without significantly affecting its screening efficiency. In contrast, at least up to 20 hours (and perhaps even longer), the FSP may give a training advantage that transfers to UPT flying and increases with the number of flying hours, thus suggesting that the program should be lengthened. The decision of which path to take must be based on considerations not addressed by these data, such as policy issues and the economic costs and benefits of an extended FSP versus the use of psychomotor scores and lesson grades to reduce FSP training time.

#### REFERENCE

- Bordelon, V.P., & Kantor, J.E. (1986, July). Utilization of psychomotor screening for USAF pilot candidates: Independent and integrated selection methodologies (AFHRL-TR-86-4, AD-A170 353). Brooks AFB, TX: Manpower and Personnel Division, Air Force Human Resources Laboratory.

APPENDIX A: TABLES

**Table A-1. Overall (Screening and Training) Effect  
(Groups I & III), T-37 Phase, Overall Attrition**

Group	Pass	Fail (all)	Total
III (FSP)	409	105	514
(%)	(80)	(20)	(100)
I (No FSP)	79	44	123
(%)	(64)	(36)	(100)
Total	488	149	637
(%)	(77)	(23)	(100)

Note.  $\chi^2 = 12.20$ ,  $df = 1$ ,  $p < .001$ .

**Table A-2. Overall (Screening and Training) Effect  
(Groups I & III), T-37 Phase, FTD Attrition**

Group	Pass	Fail (FTD)	Total
III (FSP)	409	56	465
(%)	(88)	(12)	(100)
I (No FSP)	79	27	106
(%)	(75)	(25)	(100)
Total	488	83	571
(%)	(85)	(15)	(100)

Note.  $\chi^2 = 11.47$ ,  $df = 1$ ,  $p < .001$ .

**Table A-3. Overall (Screening and Training) Effect  
(Groups I & III), UPT Final Outcome Overall Attrition**

Group	Pass	Fail (all)	Total
III (FSP)	380	134	514
(%)	(74)	(26)	(100)
I (No FSP)	69	54	123
(%)	(56)	(44)	(100)
Total	449	188	637
(%)	(70)	(30)	(100)

Note.  $\chi^2 = 14.33$ ,  $df = 1$ ,  $p < .001$ .

**Table A-4. Overall (Screening and Training) Effect  
(Groups I & III) UPT Final Outcome FTD Attrition**

Group	Pass	Fail (FTD)	Total
III (FSP) (%)	380 (83)	78 (17)	458 (100)
I (No FSP) (%)	69 (67)	34 (33)	103 (100)
Total (%)	449 (80)	112 (20)	561 (100)

Note.  $\chi^2 = 12.4$ ,  $df = 1$ ,  $p < .001$ .

**Table A-5. Screening Effect (Group III versus FSP Passes  
in Group IV), T-37 Phase, Overall Attrition**

Group	Pass	Fail (all)	Total
III (Normal FSP Passes) (%)	409 (80)	105 (20)	514 (100)
IV (FSP Passes) (%)	188 (81)	44 (19)	232 (100)
Total (%)	597 (80)	149 (20)	746 (100)

Note.  $\chi^2 = .13$ ,  $df = 1$ ,  $p$ : NS.

**Table A-6. Screening Effect (Group III versus FSP Passes  
in Group IV), T-37 Phase, FTD Attrition**

Group	Pass	Fail (FTD)	Total
III (Normal FSP Passes) (%)	409 (88)	56 (12)	465 (100)
IV (FSP Passes) (%)	188 (90)	20 (10)	208 (100)
Total (%)	597 (89)	76 (11)	673 (100)

Note.  $\chi^2 = .62$ ,  $df = 1$ ,  $p$ : NS.



**Table A-7. Screening Effect (Group III versus FSP Passes in Group IV), UPT Final Outcome, Overall Attrition**

Group	Pass	Fail (all)	Total
III (Normal FSP Passes)	380	134	514
(%)	(74)	(26)	(100)
IV (FSP Passes)	175	56	231
(%)	(76)	(24)	(100)
Total	555	190	745
(%)	(74)	(26)	(100)

Note.  $\chi^2 = .19$ ,  $df = 1$ ,  $p$ : NS.

**Table A-8. Screening Effect (Group III versus FSP Passes in Group IV), UPT Final Outcome, FTD Attrition**

Group	Pass	Fail (FTD)	Total
III (Normal FSP Passes)	380	78	458
(%)	(83)	(17)	(100)
IV (FSP Passes)	175	28	203
(%)	(86)	(14)	(100)
Total	555	106	661
(%)	(84)	(16)	(100)

Note.  $\chi^2 = .87$ ,  $df = 1$ ,  $p$ : NS.

**Table A-9. Screening Effect (Group IV FSP Passes versus Fails), T-37 Phase, Overall Attrition**

Group	Pass	Fail (all)	Total
IV (FSP Passes)	188	44	232
(%)	(81)	(19)	(100)
V (FSP Fails)	14	20	34
(%)	(41)	(59)	(100)
Total	202	64	266
(%)	(76)	(24)	(100)

Note.  $\chi^2 = 23.65$ ,  $df = 1$ ,  $p < .001$ .

**Table A-10. Screening Effect (Group IV FSP Passes versus Fails), T-37 Phase, FTD Attrition**

Group	Pass	Fail (FTD)	Total
IV (FSP Passes)	188	20	208
(%)	(90)	(10)	(100)
V (FSP Fails)	14	10	24
(%)	(58)	(42)	(100)
Total	202	30	232
(%)	(87)	(13)	(100)

Note.  $\chi^2 = 16.89$ ,  $df = 1$ ,  $p < .001$ .

**Table A-11. Screening Effect (Group IV FSP Passes versus Fails), UPT Final Outcome, Overall Attrition**

Group	Pass	Fail (all)	Total
IV (FSP Passes)	175	57	232
(%)	(75)	(25)	(100)
V (FSP Fails)	10	24	34
(%)	(29)	(71)	(100)
Total	185	81	266
(%)	(70)	(30)	(100)

Note.  $\chi^2 = 27.52$ ,  $df = 1$ ,  $p < .001$ .

**Table A-12. Screening Effect (Group IV FSP Passes versus Fails), UPT Final Outcome, FTD Attrition**

Group	Pass	Fail (FTD)	Total
IV (FSP Passes)	175	29	204
(%)	(86)	(14)	(100)
V (FSP Fails)	10	13	23
(%)	(43)	(57)	(100)
Total	185	42	227
(%)	(81)	(19)	(100)

Note.  $\chi^2 = 21.81$ ,  $df = 1$ ,  $p < .001$ .

**Table A-13. Screening Effect (Groups III versus IV),  
T-37 Phase, Overall Attrition**

Group	Pass	Fail (all)	Total
III (Screened)	409	105	514
(%)	(80)	(20)	(100)
IV (Not Screened)	202	64	266
(%)	(76)	(24)	(100)
Total	611	169	780
(%)	(78)	(22)	(100)

Note.  $\chi^2 = 1.16$ ,  $df = 1$ ,  $p$ : NS.

**Table A-14. Screening Effect (Groups III versus IV),  
T-37 Phase, FTD Attrition**

Group	Pass	Fail (all)	Total
III (Screened)	409	56	465
(%)	(88)	(12)	(100)
IV (Not Screened)	202	30	232
(%)	(87)	(13)	(100)
Total	611	86	697
(%)	(88)	(12)	(100)

Note.  $\chi^2 = .05$ ,  $df = 1$ ,  $p$ : NS.

**Table A-15. Screening Effect (Groups III versus IV),  
UPT Final Outcome, Overall Attrition**

Group	Pass	Fail (all)	Total
III (Screened)	380	134	514
(%)	(74)	(26)	(100)
IV (Not Screened)	185	81	266
(%)	(70)	(30)	(100)
Total	565	215	780
(%)	(72)	(28)	(100)

Note.  $\chi^2 = 1.47$ ,  $df = 1$ ,  $p$ : NS.

**Table A-16. Screening Effect (Groups III versus IV),  
UPT Final Outcome, FTD Attrition**

Group	Pass	Fail (all)	Total
III (Screened)	380	78	458
(%)	(83)	(17)	(100)
IV (Not Screened)	185	42	227
(%)	(81)	(19)	(100)
Total	565	120	685
(%)	(82)	(18)	(100)

Note.  $\chi^2 = .14$ ,  $df = 1$ ,  $p$ : NS.

**Table A-17. Screening Effect, SIE at UPT,  
T-37 Phase**

Group	Not SIE	SIE	Total
I (No FSP)	106	10	116
(%)	(91)	(9)	(100)
IV (Not Screened)	232	16	248
(%)	(94)	(6)	(100)
Total	338	26	364
(%)	(93)	(7)	(100)

Note.  $\chi^2 = .28$ ,  $df = 1$ ,  $p$ : NS.

**Table A-18. Screening Effect, SIE at UPT,  
UPT Final Outcome**

Group	Not SIE	SIE	Total
I (No FSP)	103	11	114
(%)	(90)	(10)	(100)
IV (Not Screened)	227	18	245
(%)	(93)	(7)	(100)
Total	330	29	359
(%)	(92)	(8)	(100)

Note.  $\chi^2 = .29$ ,  $df = 1$ ,  $p$ : NS.

**Table A-19. Training/Experience Effect (Groups I versus IV),  
T-37 Phase, Overall Attrition**

Group	Pass	Fail (all)	Total
IV (Trained)	202	64	266
(%)	(76)	(24)	(100)
I (Not Trained)	79	44	123
(%)	(64)	(36)	(100)
Total	281	108	389
(%)	(72)	(28)	(100)

Note.  $\chi^2 = 5.18$ ,  $df = 1$ ,  $p < .05$ .

**Table A-20. Training/Experience Effect (Groups I versus IV),  
T-37 Phase, FTD Attrition**

Group	Pass	Fail (all)	Total
IV (Trained)	202	30	232
(%)	(87)	(13)	(100)
I (Not Trained)	79	27	106
(%)	(75)	(25)	(100)
Total	281	57	338
(%)	(83)	(17)	(100)

Note.  $\chi^2 = 7.29$ ,  $df = 1$ ,  $p < .01$ .

**Table A-21. Training/Experience Effect (Groups I versus IV),  
UPT Final Outcome, Overall Attrition**

Group	Pass	Fail (all)	Total
IV (Trained)	185	81	266
(%)	(70)	(30)	(100)
I (Not Trained)	69	54	123
(%)	(56)	(44)	(100)
Total	254	135	389
(%)	(65)	(35)	(100)

Note.  $\chi^2 = 6.14$ ,  $df = 1$ ,  $p < .05$ .

**Table A-22. Training/Experience Effect (Groups I versus IV),  
UPT Final Outcome, FTD Attrition**

Group	Pass	Fail (FTD)	Total
IV (Trained) (%)	185 (81)	42 (19)	227 (100)
I (Not Trained) (%)	69 (67)	34 (33)	103 (100)
Total (%)	254 (77)	76 (23)	330 (100)

Note.  $\chi^2 = 7.61$ ,  $df = 1$ ,  $p < .01$ .

**Table A-23. Effect of 6 Hours Extra FSP Training  
(Groups II versus III), T-37 Phase,  
Overall Attrition**

Group	Pass	Fail (all)	Total
II (20 Hr) (%)	52 (91)	5 (9)	57 (100)
III (14 Hr) (%)	409 (80)	105 (20)	514 (100)
Total (%)	461 (81)	110 (19)	571 (100)

Note.  $\chi^2 = 3.67$ ,  $df = 1$ ,  $p$ : NS.

**Table A-24. Effect of 6 Hours Extra FSP Training  
(Groups II versus III), T-37 Phase,  
FTD Attrition**

Group	Pass	Fail (FTD)	Total
II (20 Hr) (%)	52 (98)	1 (2)	53 (100)
III (14 Hr) (%)	409 (88)	56 (12)	465 (100)
Total (%)	461 (89)	57 (11)	518 (100)

Note.  $\chi^2 = 4.03$ ,  $df = 1$ ,  $p < .05$ .

**Table A-25. Effect of 6 Hours Extra FSP Training  
(Groups II versus III), UPT Final Outcome,  
Overall Attrition**

Group	Pass	Fail (all)	Total
II (20 Hr) (%)	50 (88)	7 (12)	57 (100)
III (14 Hr) (%)	380 (74)	134 (26)	514 (100)
Total (%)	430 (75)	141 (25)	571 (100)

Note.  $\chi^2 = 4.53$ ,  $df = 1$ ,  $p < .05$ .

**Table A-26. Effect of 6 Hours Extra FSP Training  
(Groups II versus III), UPT Final Outcome,  
FTD Attrition**

Group	Pass	Fail (FTD)	Total
II (20 Hr) (%)	50 (96)	2 (4)	52 (100)
III (14 Hr) (%)	380 (83)	78 (17)	458 (100)
Total (%)	430 (84)	80 (16)	510 (100)

Note.  $\chi^2 = 5.18$ ,  $df = 1$ ,  $p < .05$ .

**Table A-27. Zero-Order Correlations Between Variables,  
T-37 Phase, Pass/Overall Attrition  
(All Cases)**

	T-37 P/overall attrition	Sum of FSP grades	FSP8	FSP9	FSP10	FSP11
Sum of FSP Grades	.285					
FSP 8	.264	.793				
FSP 9	.156	.824	.542			
FSP 10	.109	.602	.304	.423		
FSP 11	.234	.824	.538	.625	.396	
FSP 12	.280	.532	.355	.272	.216	.299

**Table A-28. Zero-Order Correlations Between Variables,  
T-37 Phase, Pass/FTD Attrition (All Cases)**

	T-37 P/FTD attrition	Sum of FSP grades	FSP 8	FSP 9	FSP 10	FSP 11
Sum of FSP Grades	.277					
FSP 8	.246	.792				
FSP 9	.170	.829	.545			
FSP 10	.142	.620	.317	.438		
FSP 11	.249	.828	.542	.639	.416	
FSP 12	.206	.538	.361	.278	.253	.302

**Table A-29. Prediction of T-37 Phase Pass/Overall Attrition,  
Results by FSP Grades for Lessons 8 - 12,  
(FSP Group III, N = 514)**

	R <sup>2</sup>	No. var	LS										
A. R <sup>2</sup> and Level of Statistical Significance													
Model I (grades 8 - 12)	.119	5	.001										
Model II (12 dropped)	.083	4	.001										
Model III (11, 12 dropped)	.071	3	.001										
Model IV (10, 11, 12 dropped - 8, 9 only)	.070	2	.001										
Model V (9, 10, 11, 12 dropped - 8 only)	.070	1	.001										
Model VI (9 only)	.024	1	.001										
Model VII (10 only)	.012	1	.05										
Model VIII (11 only)	.055	1	.001										
Model IX (12 only)	.079	1	.001										
Model X (Sum of 8 - 12)	.081	1	.001										
Model XI (9, 10 only)	.027	2	.001										
Model XII (10, 11 only)	.055	2	.001										
Model XIII (11, 12 only)	.103	2	.001										
Model XIV (10, 11, 12)	.103	3	.001										
B. Significance of Differences Between Models													
	1	2	3	4	5	6	7	8	9	10	11	12	13
2	.001												
3	.001	.01											
4	.001	.05	NS										
5	.001	NS	NS	NS									
6	.001	.001	.001	.001	--								
7	.001	.001	.001	.001	--	--							
8	.001	.01	.05	.01	--	--	--						
9	.001	NS	NS	NS	--	--	--	--					
10	--	--	--	--	--	--	--	--	--				
11	.001	.001	.001	--	--	NS	.01	--	--	--			
12	.001	.001	--	--	--	--	.001	NS	--	--	--		
13	.05	--	--	--	--	--	--	.001	.001	--	--	--	
14	.01	--	--	--	--	--	--	--	--	--	--	.001	NS

Note. -- = N/A.



**Table A-30. Prediction of T-37 Phase Pass/FTD Attrition,  
Results by FSP Grades for Lessons 8 - 12, (FSP Group III, N = 465)**

	R <sup>2</sup>	No. var.	LS										
A. R <sup>2</sup> and Level of Statistical Significance													
Model I (Grades 8 - 12)	.092	5	.001										
Model II (12 Dropped)	.081	4	.001										
Model III (11, 12 Dropped)	.065	3	.001										
Model IV (10, 11, 12 Dropped - 8, 9 Only)	.062	2	.001										
Model V (9, 10, 11, 12 Dropped - 8 Only)	.060	1	.001										
Model VI (9 Only)	.029	1	.001										
Model VII (10 Only)	.020	1	.001										
Model VIII (11 Only)	.062	1	.001										
Model IX (12 Only)	.042	1	.001										
Model X (Sum of 8 - 12)	.077	1	.001										
Model XI (9, 10 Only)	.034	2	.001										
Model XII (10, 11 Only)	.064	2	.001										
Model XIII (11, 12 Only)	.081	2	.001										
Model XIV (10, 11, 12)	.081	3	.001										
B. Significance of Differences Between Models													
	1	2	3	4	5	6	7	8	9	10	11	12	13
2	.05												
3	.01	.01											
4	.01	.01	NS										
5	.01	.05	NS	NS									
6	.001	.001	.001	.001	--								
7	.001	.001	.001	.001	--	--							
8	.01	.05	NS	NS	--	--	--						
9	.001	.001	.01	.01	--	--	--	--					
10	--	--	--	--	--	--	--	--	--				
11	.001	.001	.001	--	--	NS	.01	--	--	--			
12	.01	.05	--	--	--	--	.001	NS	--	--	--		
13	NS	--	--	--	--	--	--	.01	.001	--	--	--	
14	NS	--	--	--	--	--	--	--	--	--	--	.01	NS

Note. -- = N/A.

**Table A-31. Zero-Order Correlations Between Variables,  
UPT Pass/Overall Attrition (All Cases)**

	UPT Pass/ overall attrition	Sum of FSP grades	FSP 8	FSP 9	FSP 10	FSP 11
Sum of FSP grades	.274					
FSP 8	.266	.793				
FSP 9	.162	.824	.542			
FSP 10	.096	.602	.304	.423		
FSP 11	.198	.824	.538	.625	.396	
FSP 12	.287	.532	.355	.272	.216	.299

**Table A-32. Zero-Order Correlations Between Variables,  
UPT Pass/FTD Attrition (All Cases)**

	UPT/Pass/FTD	Sum of FSP grades	FSP 8	FSP 9	FSP 10	FSP 11
Sum of FSP grades	.258					
FSP 8	.244	.790				
FSP 9	.155	.827	.536			
FSP 10	.108	.630	.325	.447		
FSP 11	.213	.832	.545	.644	.428	
FSP 12	.229	.533	.356	.269	.258	.299

**Table A-33. Prediction of UPT Pass/Overall Attrition  
Results by FSP Grades for Lessons 8 - 12 (FSP Group III, N = 514)**

	R <sup>2</sup>	No. var.	LS										
A. R <sup>2</sup> and Level of Statistical Significance													
Model I (Grades 8 - 12)	.115	5	.001										
Model II (12 Dropped)	.075	4	.001										
Model III (11, 12 Dropped)	.071	3	.001										
Model IV (10, 11, 12 Dropped - 8, 9 Only)	.071	2	.001										
Model V (9, 10, 11, 12 Dropped - 8 Only)	.071	1	.001										
Model VI (9 Only)	.026	1	.001										
Model VII (10 Only)	.009	1	.05										
Model VIII (11 Only)	.039	1	.001										
Model IX (12 Only)	.082	1	.001										
Model X (Sum of 8 - 12)	.075	1	.001										
Model XI (9, 10 Only)	.027	2	.001										
Model XII (10, 11 Only)	.039	2	.001										
Model XIII (11, 12 Only)	.096	2	.001										
Model XIV (10, 11, 12)	.096	3	.001										
B. Significance of Differences Between Models													
	1	2	3	4	5	6	7	8	9	10	11	12	13
2	.001												
3	.001	NS											
4	.001	NS	NS										
5	.001	NS	NS	NS									
6	.001	.001	.001	.001	--								
7	.001	.001	.001	.001	--	--							
8	.001	.001	.001	.001	--	--	--						
9	.001	NS	NS	NS	--	--	--	--					
10	--	--	--	--	--	--	--	--	--				
11	.001	.001	.001	--	--	NS	.01	--	--	--			
12	.001	.001	--	--	--	--	.001	NS	--	--	--		
13	.05	--	--	--	--	--	--	.001	.01	--	--	--	
14	.01	--	--	--	--	--	--	--	--	--	--	.001	NS

Note. -- = N/A.

**Table A-34. Prediction of UPT Pass/FTD Attrition  
Results by FSP Grades for Lessons 8 - 12  
(FSP Group III, N = 458)**

	$R^2$	No. var.	LS										
A. $R^2$ and Level of Statistical Significance													
Model I (Grades 8 - 12)	.089	5	.001										
Model II (12 Dropped)	.069	4	.001										
Model III (11, 12 Dropped)	.061	3	.001										
Model IV (10, 11, 12 Dropped - 8, 9 only)	.060	2	.001										
Model V (9, 10, 11, 12 Dropped - 8 only)	.060	1	.001										
Model VI (9 only)	.024	1	.001										
Model VII (10 only)	.012	1	.001										
Model VIII (11 only)	.045	1	.001										
Model IX (12 only)	.052	1	.001										
Model X (Sum of 8 - 12)	.067	1	.001										
Model XI (9, 10 only)	.026	2	.001										
Model XII (10, 11 only)	.046	2	.001										
Model XIII (11, 12 only)	.075	2	.001										
Model XIV (10, 11, 12)	.075	3	.001										
B. Significance of Differences Between Models													
	1	2	3	4	5	6	7	8	9	10	11	12	13
2	.01												
3	.001	.05											
4	.01	NS	NS										
5	.01	NS	NS	NS									
6	.001	.001	.001	.001	--								
7	.001	.001	.001	.001	--	--							
8	.001	.01	.05	.01	--	--	--						
9	.01	.05	NS	.05	--	--	--	--					
10	--	--	--	--	--	--	--	--	--				
11	.001	.001	.001	--	--	NS	.05	--	--	--			
12	.001	.01	--	--	--	--	.001	NS	--	--	--		
13	NS	--	--	--	--	--	--	.001	.001	--	--	--	
14	.05	--	--	--	--	--	--	--	--	--	--	.001	NS

Note. -- = N/A.

**Table A-35. Zero-Order Correlations Between Variables**  
**T-37 Pass/Overall Attrition**  
**(Cases with Psychomotor Test Scores, N = 122)**

	T-37 P/overall attrition	1X	1Y	2X	2Y	2Z	FSP 8	FSP 9	FSP 10	FSP 11
1X	-.044									
1Y	-.179	.882								
2X	.073	.098	.150							
2Y	-.012	.061	.089	.887						
2Z	-.036	.193	.264	.719	.662					
FSP 8	.186	-.216	-.207	.052	.024	.018				
FSP 9	.048	-.182	-.139	.071	.092	.074	.446			
FSP 10	-.010	-.160	-.118	.041	.045	.080	.188	.409		
FSP 11	.082	.012	-.038	.046	.058	.040	.429	.508	.279	
FSP 12	.181	-.131	-.174	.070	.024	.113	.506	.110	.067	.196

**Table A-36. Prediction of T-37 Phase Pass Overall Attrition  
Results by FSP Grades for Lessons 8 - 12  
(Cases with Psychomotor Test Scores, N = 122)**

	R <sup>2</sup>	No. var.	LS														
A. R <sup>2</sup> and Level of Statistical Significance																	
Model I (All Grades and Psychomotor Scores)	.177	10	.05														
Model II (Psychomotor Scores Dropped)	.054	5	NS														
Model III (Grade 8 + Psychomotor Scores)	.170	6	.01														
Model IV (Grade 8)	.035	1	.05														
Model V (8, 9 + Psychomotor)	.170	7	.01														
Model VI (8 & 9)	.036	2	NS														
Model VII (8 - 10 + Psychomotor)	.170	8	.01														
Model VIII (8 - 10)	.037	3	NS														
Model IX (8 - 11 + Psychomotor)	.170	9	.05														
Model X (As VII)	.170	8	.01														
Model XI (12 + Psychomotor)	.161	6	.01														
Model XII (11 + 12 + Psychomotor)	.162	7	.01														
Model XIII (10 - 12 + Psychomotor)	.162	8	.01														
Model XIV (9 - 12 + Psychomotor)	.164	9	.05														
Model XV (12)	.033	1	.05														
Model XVI (11 + 12)	.035	2	NS														
Model XVII (10 - 12)	.037	3	NS														
Model XVIII (9 - 12)	.037	4	NS														
B. Significance of Differences Between Models																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	.01																
3	NS	--															
4	.05	NS	.01														
5	NS	--		NS	.01												
6	.05	NS	--	NS	.01												
7	NS	--		NS	.05	NS	.01										
8	.05	NS	--	--	--	NS	.01										
9	NS	--	NS	.05	NS	.05	NS	.01									
10	--	--		--	--	--	--	--	--	--							
11	NS	--	--	--	--	--	--	--	--	--							
12	NS	--	--	--	--	--	--	--	--	--	NS						
13	NS	--	--	--	--	--	--	--	--	--	NS	NS					
14	NS	--	--	--	--	--	--	--	--	--	NS	NS	NS				
15	.05	NS	--	--	--	--	--	--	--	--	.01	.05	.05	.75			
16	.05	NS	--	--	--	--	--	--	--	--	--	.01	.05	.05	NS		
17	.05	NS	--	--	--	--	--	--	--	--	--	--	.01	.05	NS	NS	
18	.01	NS	--	--	--	--	--	--	--	--	--	--	--	.01	NS	NS	NS

Note. -- = N/A.

**Table A-37. Zero-Order Correlations Between Variables, T-37 Pass/FTD  
Attrition (Cases with Psychomotor Test Scores, N = 109)**

	T-37 P/FTD	1X	1Y	2X	2Y	2Z	FSP 8	FSP 9	FSP 10	FSP 11
1X	-.034									
1Y	-.122	.886								
2X	-.022	.101	.179							
2Y	-.165	.046	.099	.888						
2Z	-.200	.180	.276	.716	.654					
FSP 8	.135	-.266	-.253	.034	-.006	.000				
FSP 9	.010	-.184	-.113	.068	.092	.088	.430			
FSP 10	.006	-.145	-.101	.052	.063	.100	.205	.414		
FSP 11	.039	.005	-.060	.021	.036	.013	.405	.497	.313	
FSP 12	.117	-.118	-.134	.055	.000	.111	.277	.084	.087	.181

**Table A-38. Prediction of T-37 Phase Pass/FTD Attrition  
Results by FSP Grades for Lessons 8 - 12  
(Cases with Psychomotor Test Scores, N = 109)**

	R <sup>2</sup>	No. var.	LS														
A. R <sup>2</sup> and Level of Statistical Significance																	
Model I (All Grades and Psychomotor Scores)	.216	10	.01														
Model II (Psychomotor Scores Dropped)	.028	5	NS														
Model III (Grade 8 + Psychomotor Scores)	.208	6	.001														
Model IV (Grade 8)	.018	1	NS														
Model V (8, 9 + Psychomotor)	.209	7	.01														
Model VI (8 & 9)	.021	2	NS														
Model VII (8 - 10 + Psychomotor)	.209	8	.01														
Model VIII (8 - 10)	.021	3	NS														
Model IX (8 - 11 + Psychomotor)	.210	9	.01														
Model X (As VII)	.209	8	.01														
Model XI (12 + Psychomotor)	.208	6	.001														
Model XII (11 + 12 + Psychomotor)	.208	7	.01														
Model XIII (10 - 12 + Psychomotor)	.209	8	.01														
Model XIV (9 - 12 + Psychomotor)	.212	9	.01														
Model XV (12)	.014	1	NS														
Model XVI (11 + 12)	.014	2	NS														
Model XVII (10 - 12)	.014	3	NS														
Model XVIII (9 - 12)	.014	4	NS														
B. Significance of Differences Between Models																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	.001																
3	NS	--															
4	.01	NS	.001														
5	NS	--	NS	.001													
6	.01	NS	--	NS	.001												
7	NS	--	NS	.01	NS	.01											
8	.01	NS	--	--	--	NS	.001										
9	NS	--	NS	.01	NS	.01	NS	.01									
10	--	--	--	--	--	--	--	--	--								
11	NS	--	--	--	--	--	--	--	--	--							
12	NS	--	--	--	--	--	--	--	--	--	NS						
13	NS	--	--	--	--	--	--	--	--	--	NS	NS					
14	NS	--	--	--	--	--	--	--	--	--	NS	NS	NS				
15	.01	NS	--	--	--	--	--	--	--	--	.001	.001	.01	.01			
16	.01	NS	--	--	--	--	--	--	--	--	--	.001	.001	.01	NS		
17	.01	NS	--	--	--	--	--	--	--	--	--	--	.001	.001	NS	NS	
18	.001	NS	--	--	--	--	--	--	--	--	--	--	--	.001	NS	NS	NS

Note. -- = N/A.



**Table A-39. Zero-Order Correlations Between Variables,  
UPT Pass/Overall Attrition (Cases with Psychomotor Test Scores, N = 122)**

	UPT Pass/ attrition	1X	1Y	2X	2Y	2Z	FSP 8	FSP 9	FSP 10	FSP 11
1X	-.112									
1Y	-.198	.882								
2X	.102	.098	.150							
2Y	.011	.061	.089	.887						
2Z	.009	.193	.264	.719	.662					
FSP 8	.175	-.216	-.207	-.052	.024	.018				
FSP 9	.014	-.182	-.139	.071	.092	.074	.446			
FSP 10	-.074	-.160	-.118	.041	.045	.080	.188	.409		
FSP 11	.065	.012	-.038	.046	.058	.040	.429	.508	.279	
FSP 12	.184	-.131	-.174	.070	.024	.113	.306	.110	.067	.196

**Table A-40. Prediction of UPT Pass/Overall Attrition,  
Results by FSP Grades for Lessons 8 - 12  
(Cases with Psychomotor Test Scores, N = 122)**

	$R^2$	No. var	LS														
A. $R^2$ and Level of Statistical Significance																	
Model I (All Grades and Psychomotor Scores)	.153	10	.05														
Model II (Psychomotor Scores Dropped)	.063	5	NS														
Model III (Grade 8 + Psychomotor Scores)	.134	6	.05														
Model IV (Grade 8)	.031	1	.NS														
Model V (8, 9 + Psychomotor)	.137	7	.05														
Model VI (8 & 9)	.036	2	NS														
Model VII (8 - 10 + Psychomotor)	.145	8	.05														
Model VIII (8 - 10)	.044	3	NS														
Model IX (8 - 11 + Psychomotor)	.146	9	.05														
Model X (As VII)	.145	8	.05														
Model XI (12 + Psychomotor)	.132	6	.05														
Model XII (11 + 12 + Psychomotor)	.132	7	.05														
Model XIII (10 - 12 + Psychomotor)	.142	8	.05														
Model XIV (9 - 12 + Psychomotor)	.142	9	.05														
Model XV (12)	.034	1	.05														
Model XVI (11 + 12)	.035	2	NS														
Model XVII (10 - 12)	.044	3	NS														
Model XVIII (9 - 12)	.045	4	NS														
B. Significance of Differences Between Models																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	.05																
3	NS	--															
4	NS	NS	.05														
5	NS	--	NS	.05													
6	NS	NS	--	NS	.05												
7	NS	--	NS	NS	NS	.05											
8	NS	NS	--	--	--	NS	.05										
9	NS	--	NS	NS	NS	NS	NS	.05									
10	--	--	--	--	--	--	--	--	--								
11	NS	--	--	--	--	--	--	--	--	--							
12	NS	--	--	--	--	--	--	--	--	--	NS						
13	NS	--	--	--	--	--	--	--	--	--	NS	NS					
14	NS	--	--	--	--	--	--	--	--	--	NS	NS	NS				
15	NS	NS	--	--	--	--	--	--	--	--	.05	NS	NS	NS			
16	NS	NS	--	--	--	--	--	--	--	--	--	.05	.05	.05	NS		
17	NS	NS	--	--	--	--	--	--	--	--	--	--	.05	NS	NS	NS	
18	.05	NS	--	--	--	--	--	--	--	--	--	--	--	.05	NS	NS	NS

**Note.** -- = N/A.

**Table A-41. Zero-Order Correlations Between Variables,  
UPT Pass/FTD Attrition (Cases with Psychomotor  
Test Scores, N = 108)**

	UPT P/FTD	1X	1Y	2X	2Y	2Z	FSP 8	FSP 9	FSP 10	FSP 11
1X	-.147									
1Y	-.181	.886								
2X	.033	.102	.180							
2Y	-.106	.047	.100	.888						
2Z	-.119	.179	.275	.717	.655					
FSP 8	.135	-.265	-.252	.034	-.007	.001				
FSP 9	-.029	-.184	-.113	.068	.092	.088	.430			
FSP 10	-.054	-.138	-.090	.052	.062	.105	.202	.416		
FSP 11	.024	-.005	-.060	.021	.036	.013	.405	.497	.315	
FSP 12	.164	-.110	-.122	.055	-.002	.116	.275	.084	.070	.182

Table A-42. Prediction of UPT Pass/FTD Attrition Results by  
FSP Grades for Lessons 8 - 12 (Cases with Psychomotor Test Scores, N = 108)

	R <sup>2</sup>	No. var.	LS														
A. R <sup>2</sup> and Level of Statistical Significance																	
Model I (All Grades and Psychomotor Scores)	.183	10	.05														
Model II (Psychomotor Scores Dropped)	.047	5	NS														
Model III (Grade 8 + Psychomotor Scores)	.167	6	.01														
Model IV (Grade 8)	.018	1	NS														
Model V (8, 9 + Psychomotor)	.169	7	.01														
Model VI (8 & 9)	.028	2	NS														
Model VII (8 - 10 + Psychomotor)	.171	8	.05														
Model VIII (8 - 10)	.030	3	NS														
Model IX (8 - 11 + Psychomotor)	.172	9	.05														
Model X (As VII)	.171	8	.05														
Model XI (12 + Psychomotor)	.178	6	.01														
Model XII (11 + 12 + Psychomotor)	.178	7	.01														
Model XIII (10 - 12 + Psychomotor)	.181	8	.01														
Model XIV (9 - 12 + Psychomotor)	.181	9	.05														
Model XV (12)	.027	1	NS														
Model XVI (11 + 12)	.027	2	NS														
Model XVII (10 - 12)	.031	3	NS														
Model XVIII (9 - 12)	.032	4	NS														
B. Significance of Differences Between Models																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	.01																
3	NS	--															
4	.05	NS	.01														
5	NS	--	NS	.01													
6	.05	NS	--	NS	.01												
7	NS	--	NS	.05	NS	.05											
8	NS	NS	--	--	--	NS	.01										
9	NS	--	NS	.05	NS	.05	NS	.05									
10	--	--	--	--	--	--	--	--	--								
11	NS	--	--	--	--	--	--	--	--	--							
12	NS	--	--	--	--	--	--	--	--	--	NS						
13	NS	--	--	--	--	--	--	--	--	--	NS	NS					
14	NS	--	--	--	--	--	--	--	--	--	NS	NS	NS				
15	.05	NS	--	--	--	--	--	--	--	--	.01	.01	.05	.05			
16	.05	NS	--	--	--	--	--	--	--	--	--	.01	.01	.05	NS		
17	.05	NS	--	--	--	--	--	--	--	--	--	--	.01	.01	NS	NS	
18	.01	NS	--	--	--	--	--	--	--	--	--	--	--	.01	NS	NS	NS

Note. -- = N/A.